

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS RELATING TO BUILDING CONSTRUCTIONS **Best Available Copy**

(71) We, PORTAKABIN LIMITED, a British Company of Huntingdon, in the County of York, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to building constructions formed from one or more units each of which is a factory assembled self-contained portable building which incorporates legs whereby substantially the entire weight of the unit, when in use, is transmitted to the ground through such legs, and includes a body complete with floor, wall and roof structures; it being understood that by "floor structure" we mean the combination of flooring and supporting structure.

Such portable building units will hereinafter be referred to as being of the kind specified.

Preferably all windows, doors and internal fittings are provided in units of the kind specified, and where such units are in any given case to be assembled together to form a multi-unit building, provision for coupling the units together in the desired arrangement will preferably be built into the units before they leave the factory, so that the only on-site assembly work required is that of coupling the units together.

The arrangement whereby the entire weight of portable building units of the kind specified is transmitted to the ground through such legs, preferably four in number, is particularly advantageous in that a minimum of site preparation is necessary for the installation of such units, the only requirement being appropriately situated concrete, or other suitable footings. Since the floor structure of the entire unit can thus be clear of the ground, any subsequent settling of the footings or the ground beneath the installed unit will not set up in the unit stresses tending to bend the floor

structure in any direction. The whole unit can thus effectively be made a rigid construction such that there is virtually no risk of distortion in any part of the construction due to settling of the unit after installation.

One problem however, which can arise is that of displacement of two horizontally coupled units relative to each other due to differential settling. Since each unit is effectively rigid, the effect of such differential settling is concentrated on the coupling between the units. Accordingly, it is an object of the invention to provide an improved form of coupling which enables such units to be coupled together simply and in such a manner as to minimise the risk of damage to the building at the coupling due to differential settling of the coupled units whilst retaining the integrity of the structure against the weather.

Accordingly to the present invention two portable building units of the kind specified are coupled together in almost contiguous relation by means of an articulated connection substantially at the level of the floor structures of the units, a bridging structure being assembled with the wall, floor and roof structures of the units in such a manner as to provide a weather-proof connection between the units whilst also permitting relative pivoting movement of the two units about a substantially horizontal axis afforded by said articulated connection.

The bridging structure is preferably rigid and comprises a plurality of bridging members. Some or all of the bridging members may be fixedly secured at one edge only to the floor, wall or roof as appropriate of one of the units. At their opposite edges such bridging members may merely overlap the corresponding parts of the other unit so as to be horizontally slidable relative thereto, or they may be connected to such parts in a manner which permits sliding movement in both vertical and horizontal directions. Alternatively, some or all of the bridging members may be

loosely assembled with corresponding parts of both units, e.g. by being clamped under pressure sufficient to hold the bridging members in position but not such as to prevent relative sliding movement between the bridging member and parts of the units between which it extends.

Preferably the articulated connection is such as to allow a limited relative movement of the two units in horizontal and vertical directions in addition to the pivotal movement which is permitted about the axis afforded by the articulated connection.

Conveniently, the articulated connection comprises two horizontally spaced links, each pivotally connected at at least one end to one of the two units. Preferably, the links are adapted to serve to draw the two units towards one another. The links are preferably secured to the floor structures of the units.

The invention will now be described by way of example with reference to the drawings accompanying the Provisional Specification wherein:—

FIGURE 1 is a fragmentary view in side elevation showing an articulated connection between two units,

FIGURE 2 is a fragmentary view in vertical section showing bridging members in position between the two units,

FIGURE 3 is a section on a horizontal plane showing the construction of one form of bridging member which extends between the side walls of two units,

FIGURE 4 is a fragmentary section in a vertical plane showing the manner in which a link may be connected to extend between the side walls of two parallel units.

Referring firstly to Figure 1, there is shown therein an articulated connection between two portable building units 10 and 20 which are each of the kind specified, and in particular each includes a body and four legs (not shown) whereby it is supported. The two units are coupled together with their floor structures 12 and 22 respectively substantially in alignment by means of a pair of links 15 (only one of which can be seen in Figure 1) connected to the floor structures beneath opposite side walls 13 and 23.

Each link 15 comprises a turn-buckle 14 carrying an eye bolt 16 and a hook bolt 17. The eye of the eye bolt 16 is captive in a staple 18 provided on a plate which is bolted to a longitudinal beam 11 forming part of the floor structure of the unit 10.

The hook bolt 17 releasably engages in a staple 19 on a plate likewise bolted to a beam 21 forming part of the floor structure of unit 20.

As can clearly be seen from Figure 1, the relative dimensions of the eye of the eye bolt 16 and its associated staple 18 and those of the hook bolt 17 and its associated staple 19

are such as to allow a limited degree of relative movement between the units 1 and 20 bodily towards and away from one another.

By rotating the turn buckle 15, the two units can be drawn together so that they are firmly connected substantially at the level of the floor structures in an articulated manner and in almost contiguous relation.

Figures 2 and 3 illustrate the manner in which a bridging structure is assembled with the floor, wall and roof structures of the two units so as to accommodate relative pivoting movement of such units about a generally horizontal axis afforded by said articulated connections, the latter not being shown in such figures.

As can be seen, the floor structures 12 and 22 are bridged by a floor member 24 which rests on ledges 25 incorporated at the opposed ends of the floor structures 12 and 22. The width of the floor member 24 is made somewhat less than the intended separation between the floors of the two units so as to allow a degree of relative movement. Metal strips 26 are unemployed to cover over the gaps at opposite edges of the floor member 24, such strips being so secured as not to impede slight relative movement between the units in the longitudinal direction. Thus, as shown, the two strips 26 may be secured to only the respective floor structures, or they may alternatively both be secured to only the bridging floor member 24.

Additionally, sealing strips (not shown) may be incorporated so as to make the joint substantially impervious to the ingress of moisture and hence weatherproof.

In like manner, side wall structures 13 and 23 of the bodies are joined by bridging wall members 27 comprising inner and outer members 27a and 27b which overlap respectively with the inner and outer faces of the wall structures 13 and 23. The inner and outer members may each carry suitable sealing strips so as to engage the inner and outer surfaces of the wall structures in such a manner as to provide a weatherproof joint which allows relative sliding movement between the overlapping parts. The bridging wall member 27 may be fixedly secured to the wall structure of one of the units, or alternatively it may be retained in position solely by friction, the inner and outer members 27a and 27b gripping the vertical margins of the wall structures 13 and 23, with a force sufficient to maintain the bridging member in assembled relation with the wall structures whilst still allowing relative sliding movement of the overlapping parts.

Respective roof structures 28 and 29 of the units as shown in Figure 2 include fascia end panels 28a and 29a, and the roof structures are bridged by appropriate

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bridging strips 31 and 32 respectively fixed at the upper and lower edges of one of the facia panels and overlapping the corresponding edge of the other such panel. Again, suitable sealing strips may be incorporated as appropriate. Alternatively, the outer bridging strip 31 may be formed of a flexible material and be secured at opposed edges to both roof assemblies.

In an alternative arrangement, the facia panels 28a, 29a, may be omitted so as to enable the two units to be coupled together with a full height passage at the junction. In this case, the bridging for connecting together the two roof structures may be generally similar to that for connecting together the side wall structures.

It will be appreciated that, by deliberately providing for an articulated connection between the two units, and by using bridging members which do not seek to prevent relative movement between the two units, no major stresses can arise at the junction of the two units. In this way, damage to or deterioration of the coupling between the two units is effectively avoided in a simple manner which is very easily carried out after the two units have been deposited in the required positions. Further, since the length of the connection between the two units is adjustable in the embodiment described, it is not necessary for the two units to be positioned with great accuracy before they can be coupled together.

Referring now to Figure 4, this shows the manner in which a transverse connection is established between two units. Figure 4 shows a unit 40 with a body including a floor structure 41, roof structure 42 and side wall structure 43. The latter is formed with an opening 44 for access through a transverse connection to a further unit. Such further unit may constitute bridging a unit 45 connected in turn to another unit (not shown) similar to the unit 40 and extending parallel thereto in spaced relation. The bridging unit 45 includes a body comprising a floor structure 46, roof structure 47 and side wall structures 48, 49. Figure 4 shows only one end of such bridging structure 45, and it will be understood that the other end is connected in a similar manner to the other unit which extends parallel to the unit 40. In such an arrangement, depending on the length and size of the bridging unit 45, such unit may be supported entirely from the two units to which it is connected, or suitable foundations may be built up beneath it to support the weight thereof.

Alternatively, the bridging unit may, as described in a co-pending application No. 43018/73 Serial No. 1,492,926 of even date, itself comprise a portable building unit of the kind specified, that is to say having four legs upon which it rests. In this case, instead

of such a laterally extending unit serving as a transverse bridging unit between two parallel units, it may alternatively comprise only a lateral extension of one unit to which it is secured.

As in the arrangement described in Figures 1 to 3, the connection between the units 40 and 45 is articulated. The articulated connection 50 comprises an eye 51 secured to the side wall structure 43 of the unit 40 slightly below floor level and a hook bolt 52 which engages the eye and is carried by a generally Z-section beam 53 which extends transversely at the end of the floor structure 46 of the bridging unit 45. The beam 53 extends laterally outwardly of the side wall structures 48 and 49 of that unit, and one such articulated connection 50 is provided at each end thereof at positions where the hook bolts 52 are externally accessible.

As can be seen, the shank of the hook bolt 52 passes through an aperture in the vertical web of the beam 53, and a wing nut 54 is tightened against such web. The upper flange 55 of the beam 53 has a downturned flange at its free edge which engages the outer face of the wall structure 43, so that the flange 55 serves as a bridging member between the floor structure 46 of the bridging unit 45 and the floor structure 41 of the unit 40. A flat metal strip 56 may be secured to the structure 41 to extend through the opening 44 and over the flange 55.

A Z-section beam 57 is provided at the end of the roof structure 47 to bridge the gap up to the side wall structure of the unit 40 and is arranged with a downwardly extending flange 58 abutting the outer face of the side wall structure 43 of the unit 40. The horizontal web of the beam 57 carries a sealing strip 59 which also engages said wall structure. A flexible, waterproof member 60 extends between a longitudinally extending facia 61 of the roof structure 42 and the outer surface of the roof structure 47.

The gaps between the side wall structures 48 and 49 of the unit 45 and the side wall structure 43 of the unit 40 is bridged by means of a Z-section beam (not shown) similar to the beam 57 which likewise carries a sealing strip forming a vertical extension of the sealing strip 59. Connections are also established between the outer faces of the side wall structures 48 and 49 and the side wall structure 43 by the use of flexible waterproof material similar to that shown at 60.

#### WHAT WE CLAIM IS:—

1. A building assembly comprising two portable building units of the kind specified coupled together in almost contiguous relation by means of an articulated connection substantially at the level of the floor structures of the units, a bridging structure

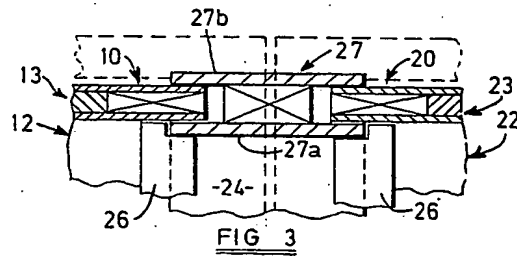
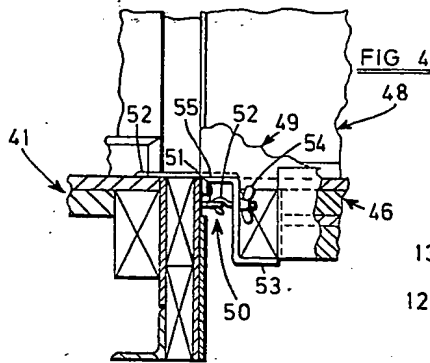
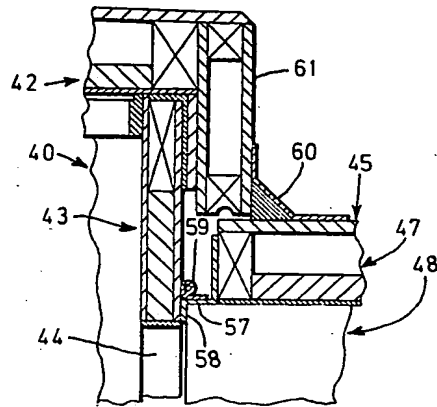
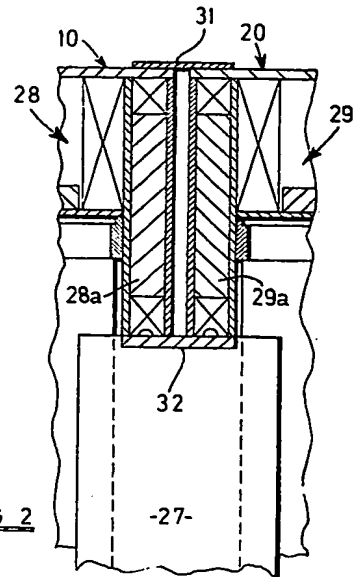
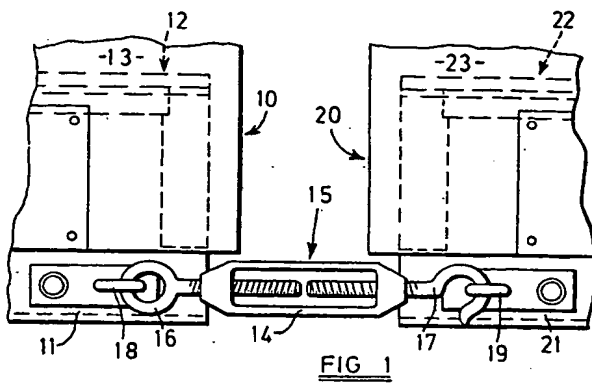
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- being assembled with the wall, floor and roof structures of the units in such a manner as to provide a weatherproof connection between the units whilst also permitting relative pivoting of the two units about a substantially horizontal axis afforded by said articulated connection. 50
2. An assembly according to Claim 1 wherein the bridging structure is rigid and comprises a plurality of bridging members all of which are, at least at one of their horizontally opposed edges, so assembled with the body of the adjacent unit as to permit relative movement between all of said members and at least one of the units. 55
3. An assembly according to Claim 2 wherein some or all of the bridging members are fixedly secured at one edge to one of the units. 60
4. An assembly according to Claim 3 wherein the bridging members, at those edges which are not fixedly secured, overlap adjacent parts of the wall, floor or roof structures so as to be horizontally slidable relative thereto. 65
5. An assembly according to Claim 3 wherein said bridging members, at the edges opposite to those at which they are secured, are so arranged relative to adjacent parts of the wall, floor or roof structures as to permit movement relative to such structures in both vertical and horizontal directions. 70
6. An assembly according to Claim 2 wherein some or all of the bridging members are so assembled with the bodies of the adjacent units at both of said opposed edges as to permit movement relative to both units. 75
7. An assembly according to any one of Claims 2 to 6 wherein said bridging members, at those edges which are not fixedly secured, are clamped in position under pressure sufficient to hold the bridging members in assembled relation with the wall, floor or roof structures of the adjacent unit but not such as to prevent relative sliding movement between the bridging members and the adjacent unit. 80
8. An assembly according to any one of the preceding claims wherein the articulated connection is such as to allow a limited relative movement of the two units in horizontal and vertical directions in addition to the pivotal movement which is permitted about the axis afforded by the articulated connection. 85
9. An assembly according to any one of the preceding claims wherein the articulated connection comprises two horizontally spaced links, each pivotally connected at least one end to one of the two units.
10. An assembly according to Claim 8 wherein the links are adapted to serve to draw the two units towards one another.
11. An assembly according to Claim 8 or Claim 9 wherein the links are secured to the floor structures of the two units.
12. An assembly according to any one of the preceding claims wherein the two units are joined together in end to end relation.
13. A building assembly comprising two portable building units of the kind specified coupled together by means of an articulated connection and bridging members all substantially as hereinbefore described with reference to and as shown in Figures 1 to 3 of the Provisional drawings.
14. A building assembly comprising two portable building units of the kind specified coupled together by means of an articulated connection and bridging members all substantially as hereinbefore described with reference to and as shown in Figure 4 of the Provisional drawings. 85

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